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**FORMATION OF PROFESSIONAL COMPETENCES BY  
MODERN INFORMATIZATION**

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*Abstract*

The aim of this study is to present the process of forming the professional competence of bachelors in the field of “Technology of artistic processing of materials” in the system “study group – college – university” by informatization. In accordance with this purpose, the following tasks were accomplished: we have analyzed the existing problems; the educational system “study group – college – university” was created; and also we have implemented a system of professional selection. The methodology of forming professional competencies by informatization was introduced at all stages of the given system. The following methods are used: analysis, modeling, and actualization. Modern scientists repeatedly outlined the importance of the questions about the need for continuous improvement in the field of information technologies for the purpose of targeting, selecting and implementing funds in the professional field, expanding the information base for providing educational institutions, and the need for the teaching staff mobility in advancing their educational level in the field of information and communication technologies. Thus, there is a need to create a unified system of primary professional selection, secondary vocational education and higher education in the major «Technology of artistic processing of materials». Primary professional selection is necessary to avoid situations of frustration with the profession, which is realized with the help of modern informatization. The indicator of the methodology effectiveness is graduating from the university in the educational program of the major «Technology of artistic processing of materials», and the graduate employability.

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**Keywords:** Education, professional competence, informatization, system.



## **1. Introduction**

Modern processes occurring in the society are characterized by mobility and movability. The given tendencies did not pass by the education system; in which alongside with the change in state standards, requirements for graduates, there is a constant development of information resources and informatization directly influencing the formation of professional competencies (Rudenko, Alieva, Ahmetzhanova, & Livshits, 2017). To date, a graduate-bachelor in the major «Technology of artistic processing of materials» should master almost all informatization to solve professional problems, apply them in practice, and seek ways to implement professional goals (Kasatova & Sedova, 2017).

## **2. Problem Statement**

At the same time, there are a number of contradictions that have shown that the topic of this research is relevant at the current stage: between the targeted selection of students of secondary general and secondary professional educational institutions for admission to the university and the insufficient formation of professional self-determination among students; between the need for continuous improvement in the field of information technology, as an integral part of professional competence, and insufficient mobility in the field of saturation of educational institutions with informatization.

## **3. Research Questions**

Turning to the federal state educational standard for bachelors of the major «Technology of artistic processing of materials» we can see that the key competencies of students when mastering any kind of activity should be such personal qualities as the ability and readiness for implementation in professional activity. Thus, it is necessary to analyse the current state of the problem and to stop at the stage-by-stage formation of professional competencies using informatization.

The problem of the professional competencies formation was considered by the scientists: I.A. Zimnyaya, Ye.S. Polat, J. Raven, L.A. Ugarova, A.V. Khutorskoy et al.; theoretical foundations of the competence approach in education are reflected in the works of V.I. Andreyeva, A.A. Verbitskii, E.F. Zeyer, et al.; V.G. Beziulyova, V.D. Shadrikov et al. worked in the field of psychology of the professional competence formation (Ugarova, 2010).

Baydenko (2004) systematized research in this area and presented the most relevant wording “professional competence”: 1) as the acquisition of knowledge, abilities and skills in a particular area of professional activity; as cooperation in a professional environment with colleagues; 2) as elements of competence: performance criteria (measure of quality), scope, required knowledge; 3) as the effective use of their abilities, allowing fruitful implementing in the professional sphere; 4) as an integrated combination of knowledge, skills and attitudes.

Many authors represented the structure of professional competencies of bachelors, in which the following structural components were distinguished: a communicative element, a cognitive element, a technological element and a special element (Ugarova, 2010; Artemeva & Zykova, 2018; Chandra & Baikina, 2018). The technological competence is logically included in the professional competence of bachelors, which is the ability of the student “... to understand and implement the instruction, the

description of the technology, the algorithm of activity and its installation” (Yamalieva, 2006, p.11). We agree with the author, who believes that

*at a technical university to the technological component of the competences of a student, one can include functional knowledge, i.e. formed on the basis of subject knowledge, skills, technically competent professional language of a specialist, technically literate written and oral speech; the ability to formulate the question technically correctly, generalizations, conclusions; conscious motor skills; conscious motor skills of mastering the technique, etc. (Yamalieva, 2006, p.12)*

#### **4. Purpose of the Study**

Thus, the purpose of this study will be the formation of professional competence of bachelors in the major “Technology of artistic processing of materials” in the system “study group – college – university” by informatization.

#### **5. Research Methods**

At the same time, referring to the federal state standard of higher education, it is necessary to demonstrate the main stages of the professional activity of bachelors in the major “Technology of artistic processing of materials” according to the curriculum. Artistic processing of materials is noted to be a narrowly focused field of activity that is based on art techniques existing, open, applied and the technologies such as: forging, chasing, casting, filigree, Florentine mosaic, etc. But modern materials and equipment are capable to simplify the technological process of manufacturing a particular product greatly, or use non-traditional materials and methods of processing to achieve their goals. Any study of the material is based on the existing experience of previous generations, which is fixed in various forms of storage and transmission of information (Gendina, 2016). The task of the trainees is to find, analyse the theoretical material and practical experience on a topic and systematize it for further preservation and use in the professional sphere (Gavritskov, Kasatova, Lymareva, Gerasimova, & Shiller, 2015). Thus, the first stage of the professional activity of bachelors will be the search, processing, analysis and interpretation of scientific, historical, cultural, methodological information. As an example of the professional competence formed (PC) we will cite PC-12 “The ability to systematize and classify materials and technological processes depending on the functional purpose and artistic features of the fabricated object”.

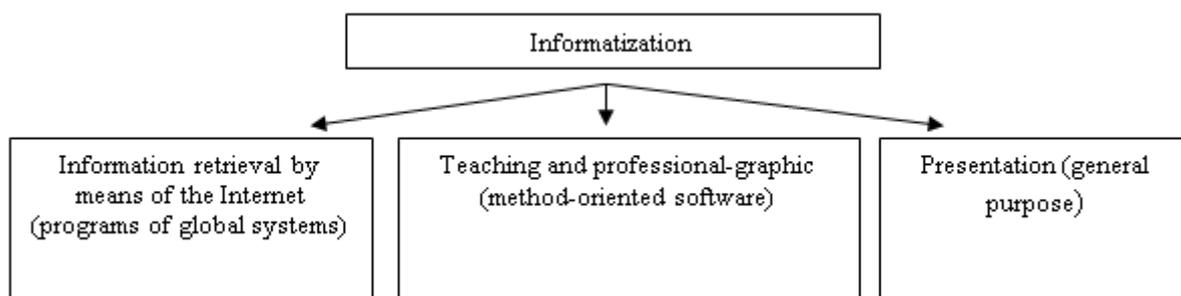
The next stage in the professional activity of bachelors is the development of an art product in accordance with specified parameters, purpose, aesthetic criteria, which includes: the author's design, product design, the choice of materials and methods for artistic processing of materials, taking into account the subtleties of techniques. Here, the material, the purpose of the future product, style features and other indicators are determined (Vereshchagina, Gladkaja, & Pisareva, 2016). Graphic editors of various levels (raster, vector, editors of three-dimensional graphics) are used as the informatization. The choice of the given editors depends on the following factors: on the level of professional training, on the design task, on the type of the product being designed, and on the way the idea is implemented (Kruchinina & Kruchinin, 2016). As an example of the formed professional competence (PC) we will cite

PC-16 “The ability to create models of artistic and industrial objects, processing technologies and systems for assessing their quality”.

Then follows the implementation of the projected object in the material. For this stage, it is necessary to design all kinds of industrial sites, equipment and other elements for small-scale production of art products, fixing all technological operations, indicators, compilation of technical and technological documentation. At this stage, various types of graphic editors, text editors, spreadsheets, etc. are used (Gendina, 2015). As an example of the professional competence formed (PC) we will take PC-14 “The ability to design sites and individual units for small-scale production of art products”.

And the final stage is the preservation of all stages, all documentation and presentation of the finished product, which contains all the information about the developed object. In order to implement this stage, modern means of information storage are used (Gudilina, 2016). Thus, we see that students should not only master all modern means of information storage and processing, but also make their choice according to the purpose of the product, its manufacturing method, manufacturing technology. For example, if a jewellery product is projected, the software selection is based on highly specialized tools suitable for this type of product (for example, programs such as Rhino, Magics, ZBrush).

Conditionally, all the hardware and software were divided into groups (Figure 01):



**Figure 01.** Hardware and software Information retrieval means with the help of the Internet (programs of global systems):

electronic catalogues of the educational institution library;  
with the use of browsers such as Internet Explorer, Netscape Navigator, Mozilla Firefox, Google Chrome;  
various search engines – Yandex.ru, Rambler.ru, Google.ru, Mail.ru, Metabot.ru, Yahoo.com, Lycos.com, altavista.com, sputnik.ru (Halvorsen, 2012).

Teaching hardware and software are computer programs and training systems, which are computer textbooks, diagnostic or test systems, simulators and simulation programs, laboratory complexes, expert systems, databases and knowledge bases in various fields, providing access to accumulated knowledge, applied and instrumental software that provides the implementation of specific training operations (text processing, tabulation, etc.) (Liia, Heidmets, & Virkus, 2015).

Teaching and professional-graphic (method-oriented software):

raster editors – Adobe Photoshop, GIMP, Krita, Photofiltre and Paint.NET;

-Vector editors – Adobe Illustrator, Corel Draw, Inkscape;

-hybrid editors – RasterDesk (for AutoCAD) and Spotlight;

-programs for creating schemes, drawings and graphs Visio;

computer-aided design and drawing systems (CAD) AutoCAD, DesignCAD, TurboCAD, COMPASS, etc.

The general-purpose software includes presentation software. Creation of presentations is necessary for students to make a report at conferences, attract attention to their creative projects, and defend course and diploma papers. The presentation helps to successfully present the idea, thought, project of the student. The shell is of great importance – the program for creating presentations itself, visual interaction with the audience. The most common program is Microsoft Power Point. Over the past years, many new programs for creating presentations have appeared – AppleKeynote, Google SketchUp, for creating flash presentations Prezi, Haiku Deck, Slides, etc. (Drozdova & Guseva, 2017).

In general, we agree with the authors Dzyatkovskaya and Mamchenko (2016), who believe that the essence of the concept of the future social arrangement is to recognize that the main source of development and prosperity will be information (cognitive, creative, spiritual) activity, and the main resource and wealth – knowledge, meanings, ideas, and their creator – an information man (cognitive, creative).

But, despite the professional competencies formed within the walls of the university, there is a need to inform about the profession of students of medium-sized, full and medium professional institutions. Since before the students there is a wide choice from the world of professions, and there are problems associated with the choice of the future vector of professional development (Mirzagitova, Mukhametgaliyeva, & Tirigulova, 2015). This is explained by the fact that the majority of high school students have only a figurative idea of the current labour market, existing professions, are not able to correlate the demands placed on a specific field of professional activity with their individuality. An important indicator for admission is the formed professional self-determination of students and informatization of all levels of education. In the modern world, professional self-determination is not a one-time act of choosing a future profession, but a long process of development in a professional way. In this connection, we propose to introduce this process on the example of the system for artistic processing of stone “study group – college – university” (Akhmetshin, Averianova, Tubalets, Novikova, & Prikhodko, 2019).

The study of methods of processing materials must be taught with the fundamentals of stone cutting at an early age. At present, there are circles of stone-cutting art on the basis of additional education, in which the first acquaintance with the natural stone takes place. In these circles, students learn techniques of crushing natural rock of soft breeds, learn to compose simple compositions from various stones, revealing their decorative properties, and communicating on topics of interest. It is during this period that the motivation for the activity in the field of artistic stone processing is developed, through interest in technology, through the use of the communication experience and interaction in the intercultural space by means of Internet technologies. In the modern world, the possibility of gaining experience of communication with representatives of the professional sphere became possible in real time. The organization of video bridges for communication, participation in various professional forums, videoconferences, etc. can be an example of such technologies (Kasatova & Sedova, 2017).

The next stage of teaching stone-carving art passes from the area of additional education to the field of secondary vocational education, where the practical classes are given the bulk of the time and

workload. It is in the average vocational education where basic professional competences are formed. There is an awareness of the generations experience, fixed in the practical skills of working with the material and implemented in their own searches, ideas, products. The use of opportunities is not only a means for students to accumulate knowledge in various areas of social reality, but also a factor in changing their attitude to learning as self-education, within the framework of a conscious choice of social values, educational self-regulation, social self-determination and self-realization. Already at this stage, specific, narrowly focused information (cognitive, creative, spiritual) activity allows to be realized professionally, where “information in the form of knowledge, meanings, ideas, cultural values are considered as a public ownership (along with natural goods)” (Gendina, 2016, p.6). At this stage, information tools are considered from several positions:

as information resources (sociocultural, value-orientation, information-content, communicative-interactive, creative-creative, technical-functional);

as opportunities (access to cultural heritage in professional communities of both Russia and foreign countries, value-oriented orientation in culture, information-content richness of Internet communications, multilevelness of professional interrelations, interaction, communication experience, wide technical and functional spectrum of access possibilities to the Internet, the freedom to choose the practice of professional communication, high activity of the user) (Zachariev, 2006).

Students of higher education, subject to the passage of previous stages of development and professional self-determination, are capable not only of reproductive activity, but also of full creative activity in the creation of new samples, objects for artistic stone processing. Creative activity is always based on one's own activity. It is in this period that it is necessary to create conditions for the realization and self-realization of students, for creating “success” of each student, in accordance with the formed views, values, interests, way of living (Martynenko, Yakimova, & Nikolaev, 2015). We agree with the authors Kelly, Coates, and Naylor (2016), who consider and represent the model of success in teaching: “Recruitment (acquaintance, access) → Engagement (passing examinations in subjects, quality of learning outcomes, quality of students' experience) → Completion of studies (timely receipt of a specialty, additional qualities, readiness for work) → Follow-up activities (results of employment, further education, social results)” (p. 27). The presented model of success organically fits into our research.

The activities for creating new samples of artistic stone processing have their own stages. Let us consider them in more detail. The first stage is the approval of artistic design, the idea of a future product. The artistic intention directly depends on the knowledge, experience of mastering the material, its artistic possibilities, and also on the availability of figurative thinking in the student (Gavritskov et al., 2015). It is at this stage that the figurative-sensory perception of the world, the ability to think with allegories, to see the unusual in the ordinary, to reconcile reality and fantasy, acquires significance. Observation, comparison and comparison, analysis are the methods applied at this stage. Students show a higher level of intelligence, ability to plan and forecast, a need for spiritual activity, demonstrate a new type of complex behaviour; master new information technologies that enable them to realize themselves. There is a need for technical equipment of the university. These are servers, modems, communication channels, computers, network technologies, network devices, and so on. All these devices and technologies are a necessary condition in the technical realization of student's access to the Internet and constitute the

material and technical basis for the functioning of the network. Network software for client stations, servers, network protocols, a set of Internet services, Internet resources (keyboard online simulators, video on the channel, digital libraries, virtual universities, resource portals, forums, chats, YouTube, Skype, podcasts, wikis, blogs, e-mail, etc.), ensure that individual and group users work on the Internet to develop students' skills to efficiently access and use information effectively. This resource allows you to gain experience in the Internet, develop skills and acquire skills in implementing information procedures using the technical and functional capabilities of information systems. In addition to these funds, it is necessary to use highly specialized programs aimed at the formation of professional competencies. Here, often, there are difficulties with filling and timely updating of the educational process by one or other means (Batchaeva, 2017).

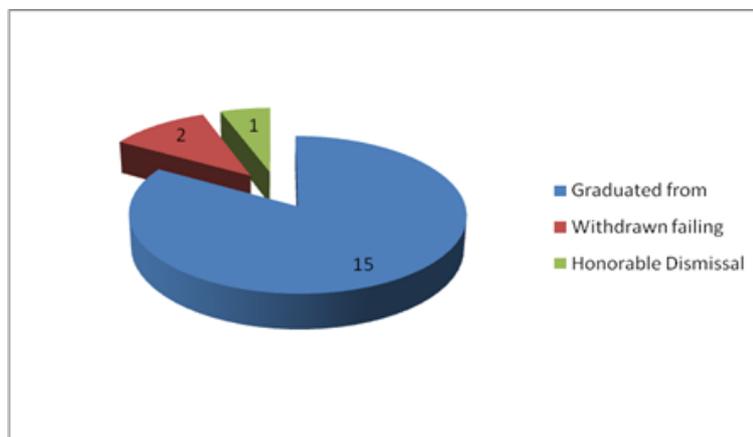
According to Gudilina (2016,) the educational standards include separate media education tasks. Financing of technical equipment of educational institutions, information and educational environment of educational institutions, electronic resources, courses for the improvement of teachers' qualification is being realized. But this is not enough. It is necessary to create conditions for constant professional self-improvement in the field of informatization means for teachers, and also to build a system of gradual, step-by-step mastering of informatization means. It is very important to improve continually the updating of programs in accordance with the development of information systems and society.

## 6. Findings

The results of the research before and after the introduction of the “study group – college – university” system are performed in Tables 1-2 and in Figures 02-03.

**Table 01.** Results of the study before the introduction of the system «study group – college – university» (people)

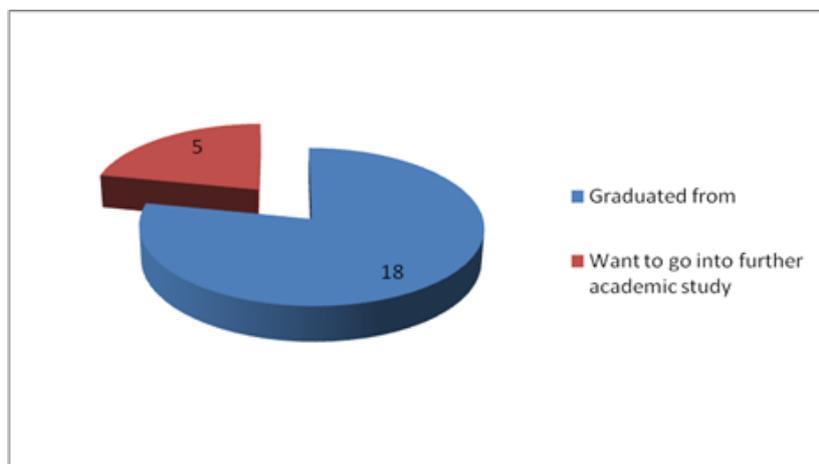
Entered	Graduated from	Withdrawn failing	Honorable Dismissal
18	15	2	1



**Figure 02.** Results of the research prior to the introduction of the “study group – college – university” system (people)

**Table 02.** Results of the study after the introduction of the system “study group – college – university” (people)

Entered	Graduated from	Withdrawn failing	Honorable Dismissal	Want to go into further academic study
18	18	0	0	5



**Figure 03.** Results of the study after the introduction of the “study group – college – university” system (people)

Table 1 demonstrates that the selection of applicants was conducted only on the basis of the results of examinations, without a professional selection, without the results of professional self-determination. Those who entered the university had little idea of the specifics of their professional activity in the major “Technology of artistic processing of materials”, and had little knowledge of modern information means. During the training of 18 people, 2 students were withdrawn failing and 1 student was honourably dismissed.

The reasons for this phenomenon at the initial stage were: 1) insufficient informative value (expanding) of the specifics of professional activity; 2) absence / low level of professional self-determination; 3) the impossibility of adaptation within the walls of the university due to the lack of primary skills in working with the informatization.

After the introduction of the system “study group – college – university” out of 18 who entered the university, 18 students completed their studies in time, which indicates the effectiveness of the system. 5 students expressed a desire to further study in the magistracy, the rest are aimed to seek work on the profession.

## 7. Conclusion

Thus, modern facilities of informatization are an integral part of the educational process at all stages. In our opinion, the process of forming professional competencies will be the most successful:

1) in the formation of professional self-determination, which significantly increases the interest in mastering the profession, which is carried out in the «study group – college – university» system by informatization;

2) with the timely filling the educational process with technical information means, information and communication technologies, special professional graphics editors and the possibility of increasing the teacher's occupational attainment.

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